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TRIP REPORT

DATE: **September 13, 2010**

TO: **Alen Fetters, AIDEA/AEA**

FROM: **David Ausman, PE**

RE: **Five-Mile Creek Stream Flow Measurement Report, August, 2010**

CC: **Project File**

PURPOSE AND BACKGROUND

In accordance with the April 5th, 2010 proposal to AEA, the objective of this field investigation was to perform the following:

- An inspection of the stream conditions and gauging equipment;
- download of the stream flow data from the intake gauging station;
- direct measurement of stream flow at the intake and culvert locations;
- and, preparation of a trip report.

Previous flow measurement methods, modeling results, and findings are presented in the Chitina Hydrology Analysis[1]. In 2009, Polarconsult Alaska, Inc. (PCA) installed a weir and stream gauging equipment to determine the adequacy of Five-Mile Creek as a hydroelectric resource for the community of Chitina. Stream flow measurements were also collected from a weir mounted on the culvert crossing of the Egerton Highway.

FIELD ACTIVITIES

Site Inspection

Polarconsult engineer Gary Paulus, CE, mobilized from to Chitina on August 19th, 2010 to inspect the existing upper weir installation and associated gauging equipment, download the data collected since the prior site visit, and to directly measure the stream flow in Fivemile Creek.

On August 19th, 2010, Mr. Paulus arrived at Fivemile Creek and performed an initial visual inspection of the culvert where the creek crosses the Edgerton Highway. The previously removed culvert weir was found adjacent to the culvert.

The following day, the intake location weir and gauge installation was inspected. Access to the site was via two miles of trail. The last half mile of trail had recently been extended to the gauging location as indicated by surveyor flagging tape and signs of brush removal.

Inspection of the upper "intake" gauge site showed damage to the weir sections and a fallen spruce tree that had nearly struck the gauging equipment enclosure, photocell panel, cable, and stand (Photo 1). Upon closer inspection of the equipment, no signs of damage from the fallen tree was identified.

[1] Chitina Hydrology Analysis, April 11, 2008. Polarconsult, Alaska Inc.

The weir that was constructed at the end of August 2009 was damaged as indicated by the displaced plywood weir sections. It is believed this damage occurred on March 3, 2010 during which ice and debris flows dislodged the weir from the stream bed. (Photo 2).

The gauging and logging equipment inside the NEMA enclosure were inspected and appeared to be in good order. No signs of water intrusion was noted and the equipment was dry at the time of inspection.

The Sutron data logger was initiated and the menu screen illuminated allowing access to screen displays with menus such as supplied voltage (13.5 vdc), current sensor reading (1.06'), and error codes (none). Download of recorded data to a SD memory card was completed. No changes were made to the data logger mode or setup conditions.

The stage height data collected was appended to the data set for analysis and to approximate flow measurements at 15 minute intervals.

Flow Measurement

Two current velocity measurements were taken at Fivemile Creek on August 20th, 2010 using the current-velocity method. The Marsh-McBirney Flowmate 2000 was used to measure water velocity as presented on the attached stream flow measurement field sheets (Appendix). The stream conditions were adequate to produce useable flow measurements. Results from both measurements are presented in Table 1.

Table 1: Fivemile Creek Stream Flow Measurements

Date/Time	Method	Location (on creek)	Flow (cfs)	Stage at Gauge (ft)
8/20/10 9:20	Current velocity	50 ft above upper weir	12.4	1.06
8/20/10 13:30	Current velocity	300ft below culvert	12.3	n/a

Note: See attached stream flow measurement field sheets for details. n/a = non-applicable

FINDINGS AND RECCOMENDATIONS

Data collected from the intake gauging site was sufficient to allow approximation of the seasonal low-flow event. However, as a result of the weir failure, the data following March 3, 2010 is unusable.

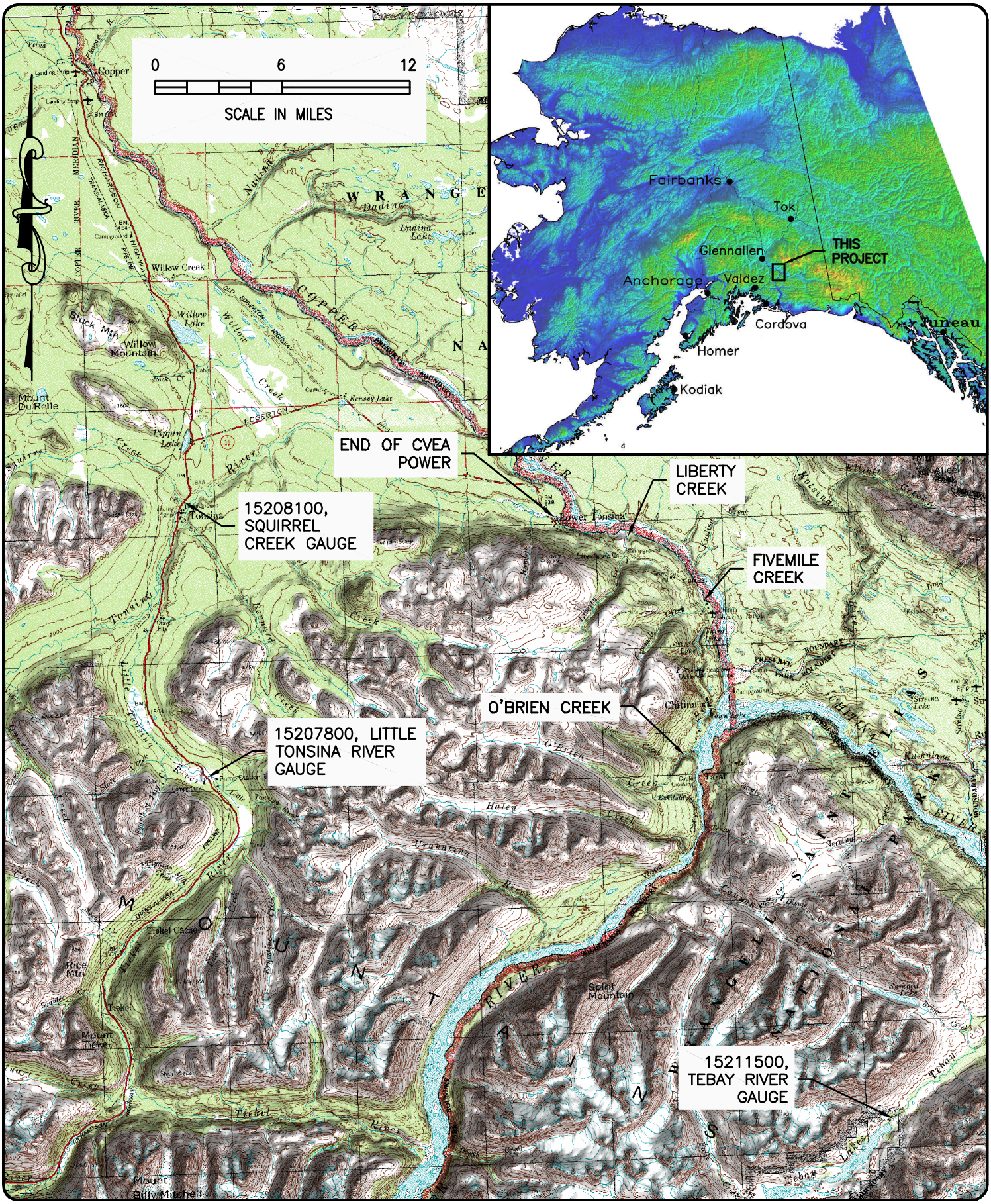
Direct stream flow measurement using the velocity method were used to verify model predictions. The similar flows measured at the upper weir and culvert location (Table 1) suggests that subsurface flow is occurring downstream of the intake weir due to the difference in drainage areas a these creek locations. The similar results may also be a result of measurement variability associated with the measurement process.

The data gap resulting from the failed weir requires the use of alternative methods to estimate the stream flow. This required approximating stream flows by comparing drainage areas as described in the Chitina Hydrology Analysis and use of the lower “culvert” weir data is recommended to establish a hybridized stream flow model. The model also requires adjustment to compensate for the delayed onset of spring thaw at Fivemile Creek resulting from the higher average drainage elevation.

Although the intake gauging station is operational, a replacement weir is required to allow continued stream flow measurement. The replacement weir needs to be constructed to withstand high flow events and damage resulting from ice movement. It is recommended that the surrounding beetle kill trees be felled to reduce the possibility of damage to the equipment.

APPENDIX

- PROJECT VICINITY MAP
- FIVEMILE PROJECT MAP
- PROJECT PHOTOGRAPHS
- STREAMFLOW MEASUREMENT FIELD SHEETS



DATE:	4/8/2008
DESIGNED:	DH
DRAWN:	DH
CHECKED:	DA
SCALE:	1"=6 MILES
FILE:	MAP

DRAWING

PROJECT VICINITY MAP

FIGURE

1

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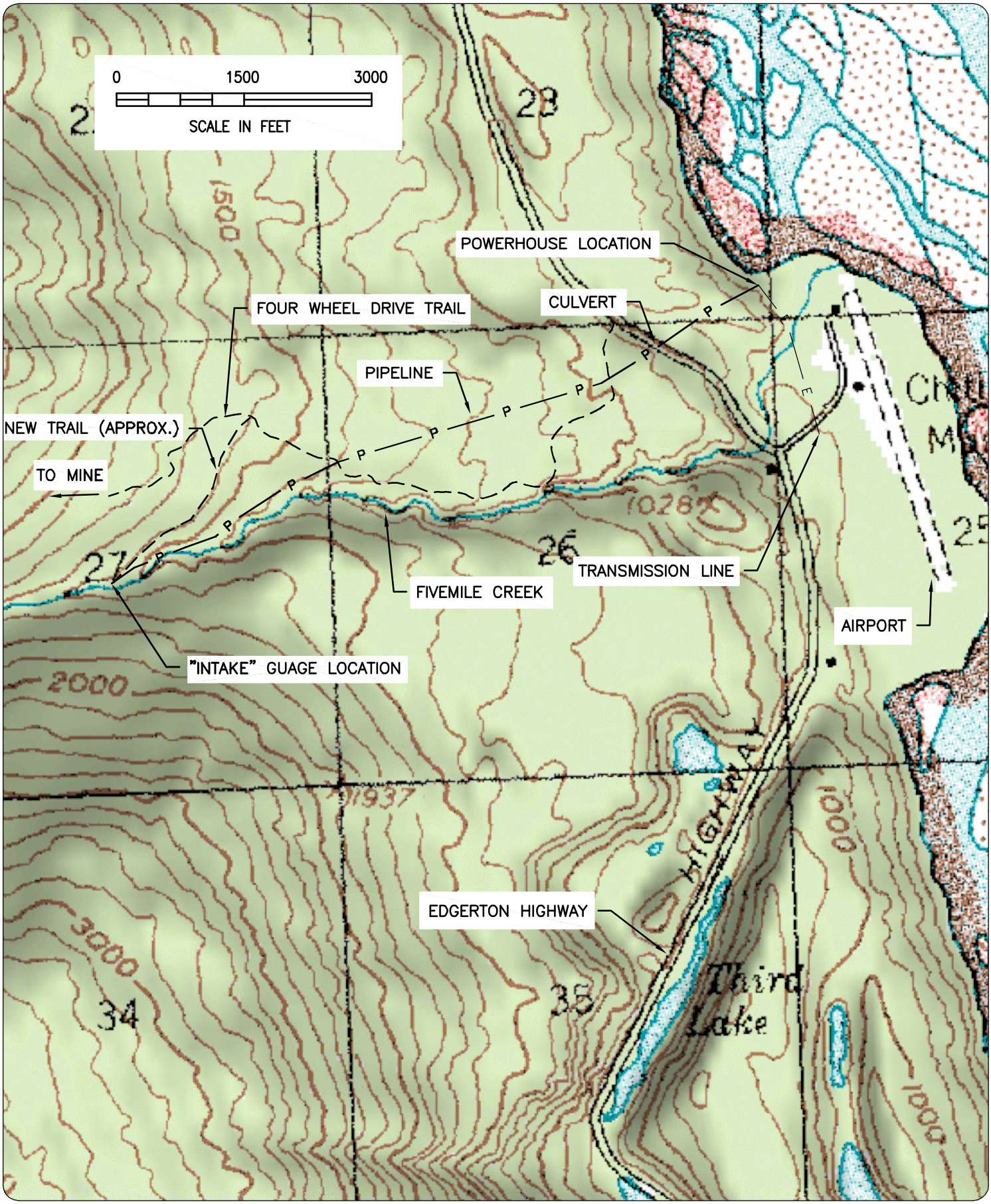
PROJECT

REGIONAL HYDROELECTRIC INVESTIGATION
CHITINA, ALASKA



DATE: 4/8/2008
DESIGNED: DH
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SCALE: 1"=6 MILES
FILE: MAP

DRAWING
FIVEMILE CREEK PROJECT MAP

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CHITINA, ALASKA

FIGURE
2

Photo 1. Upper "Intake" Gauging Site. Upstream view with fallen spruce tree in foreground and equipment post and enclosure in background.

Photo 2. Upper "Intake" Gauging Site. Downstream view with weir sections in foreground and equipment post and enclosure in background.

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STREAM FLOW MEASUREMENT FIELD SHEET

LOCATION:	Chitina Five-Mile Creek - Lower gauging site
DATE:	8-20-10
PERSONNEL:	Gary Paulus

ACCESS INFORMATION

STARTING LOCATION:	Wrangell View RV Park - Near Chitina Airport		
ACCESS ROUTE:	On foot approximately 300' West of RV park		
DPT TIME IN:	1:05 pm	DPT TIME OUT:	2:55 pm
ARR TIME IN:	1:10 pm	ARR TIME OUT:	3:00 pm
COMMENTS:	This site is 300' +/- downstream of 10' dia. Culvert.		

GAUGE INFORMATION

GAUGE ID:					
DATUM #1:	NM	TIME:		WATER LEVEL:	
DATUM #2:		TIME:		WATER LEVEL:	
WATER TEMP:	40 F (est.)	AIR TEMP:	75 F		
WEATHER CONDITIONS:	Clear				
BATTERY VOLTAGE:	N/A				
NOTES:	Previous gauging site appears to have been altered from high flow event(s) creating a poor section to take measurements. A new site was chosen downstream past root and boulder obstructions. Minor rock removal was necessary to clean up section to allow better flow characteristics for current velocity gauging method.				
MAINTENANCE PERFORMED:					
FUTURE MAINTENANCE REQUIRED					

FLOW MEASUREMENT #1

MEAS.LOCATION:	Near gauge	MEAS.TIME:	1:50 pm
MEAS. METHOD:		CURRENT VELOCITY	
EQUIPMENT:	Flo-Mate-Model 2000 flow meter		
MEAS. QUALITY	Good		

LBS SALT:		LOG FILE NAME:		CALC FLOW	12.2 CFS

STATION	DEPTH	VELOCITY	STATION	DEPTH	VELOCITY
3'	0	0			
4'	0.5	1.32			
5'	0.65	2.72			
6'	0.7	3.02			
7'	0.9	2.60			
8'	0.8	1.88			
9'	0.6	1.54			
10'	0.6	1.07			
11'	0.65	1.50			
12'	0.65	1.10			
13'	0.3	0.95			
14'	0.1	0.48			

FLOW MEASUREMENT #2

MEAS.LOCATION:	SAME AS #1	MEAS.TIME:	2:30 pm
MEAS. METHOD:		CURRENT VELOCITY	
EQUIPMENT	Same as #1 above		
MEAS. QUALITY	Good		

LBS SALT:		LOG FILE NAME:		CALC FLOW	12.3 CFS

STATION	DEPTH	VELOCITY	STATION	DEPTH	VELOCITY
14'	0	0			
13.5'	0.2	0.58			
12.5'	0.7	1.08			
11.5'	0.6	1.44			
10.5'	0.55	1.62			
9.5'	0.6	1.65			
8.5'	0.8	2.05			
7.5'	0.65	2.83			
6.5'	0.75	3.25			
5.5'	0.7	2.32			
4.5'	0.5	2.73			
3.5'	0.45	0.04			
3'	0	0			

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STREAM FLOW MEASUREMENT FIELD SHEET

LOCATION:	Chitina Five-Mile Creek - Upper Weir Location
DATE:	8-20-10
PERSONNEL:	Gary Paulus

ACCESS INFORMATION

STARTING LOCATION:	Wrangell View RV Park - Near Chitina Airport		
ACCESS ROUTE:	Edgerton Highway 1/2 mile N. to trail then 2+/-mile W		
DPT TIME IN:	8:15 am	DPT TIME OUT:	10:40 am
ARR TIME IN:	9:00 am	ARR TIME OUT:	11:26 am
COMMENTS:	Traverse foot path on steep hillside 1/2 mile to weir.		

GAUGE INFORMATION

GAUGE ID:					
DATUM #1:	Pres. sensor	TIME:	10:40 am	WATER LEVEL:	1.06'
DATUM #2:	Staff Gauge	TIME:	10:40 am	WATER LEVEL:	1.07'
WATER TEMP:	40 F (est.)	AIR TEMP:	55 F		
WEATHER CONDITIONS:	Partly Cloudy				
BATTERY VOLTAGE:	13.5 VDC				
NOTES:	Custom weir installed August of 2009 is no longer functioning. See photos of displaced remnants of the weir. Toppled 8" tree landed near monitoring stand. No apparent damaged to solar panel and equipment enclosure from the fall. Staff gauge sound as well.				
MAINTENANCE PERFORMED:	Opened environmental case for housing the Sutron data logger and Keller pressure transducer to check condition and functionality. Menu screen operated and sensor data acquisition seemed nominal. Recorded data was downloaded to SD card for later analysis. Limited tools on hand to perform weir repair to return back to service. Data logger on.				
FUTURE MAINTENANCE REQUIRED	Remove existing weir remnants and replace with newly constructed weir that can better withstand high seasonal flows and anticipated debris which probably occurs during spring breakup for this gauging site.				

FLOW MEASUREMENT #1

MEAS.LOCATION:	Near gauge	MEAS.TIME:	9:20 am
MEAS. METHOD:		CURRENT VELOCITY	
EQUIPMENT:	Flo-Mate-Model 2000 flow meter		
MEAS. QUALITY	Fair		
LBS SALT:		LOG FILE NAME:	CALC FLOW 12.5 CFS

STATION	DEPTH	VELOCITY	STATION	DEPTH	VELOCITY
7'	0	0	20'	0	0
8'	0.3	-0.8			
9'	0.4	0			
10'	0.7	0.39			
11'	0.8	1.37			
12'	0.95	1.49			
13'	1.0	2.51			
14'	0.95	2.80			
15'	0.75	2.77			
16'	0.8	1.70			
17'	0.5	0.95			
18'	0.4	1.06			
19'	0.45	1.0			

FLOW MEASUREMENT #2

MEAS.LOCATION:	SAME AS #1	MEAS.TIME:	10:00 am
MEAS. METHOD:		CURRENT VELOCITY	
EQUIPMENT	Same as #1 above		
MEAS. QUALITY	Fair		
LBS SALT:		LOG FILE NAME:	CALC FLOW 12.4 CFS

STATION	DEPTH	VELOCITY	STATION	DEPTH	VELOCITY
20'	0	0	7.5'	0.25	0
19.5'	0.4	0.81	7'	0	0
18.5'	0.45	1.05			
17.5'	0.45	2.07			
16.5'	0.65	2.0			
15.5'	0.7	1.85			
14.5'	0.75	3.0			
13.5'	1.0	2.19			
12.5'	0.95	2.21			
11.5'	0.7	1.98			
10.5'	0.7	0.7			
9.5'	0.6	0.24			
8.5'	0.25	0			